





TTCP Test Procedures for Anti-Vehicular Landmine Protection

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National Representatives on TTCP and NATO



National
Defence

Défense
nationale

Canada

The Technical Cooperation Program



- Terminal Effects Panel
- KTA 1-29 “Protection of Soft-Skinned Vehicle Occupants Against Landmine Effects”

Aims of KTA 1-29

- Establish standards
- Exchange on protection strategies
- Consolidate the information and publish a technical report

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Standards

- Protection levels

e.g. Protect at level 2 against a 6 kg TNT mine

Standards

- Protection levels
- Test Procedures

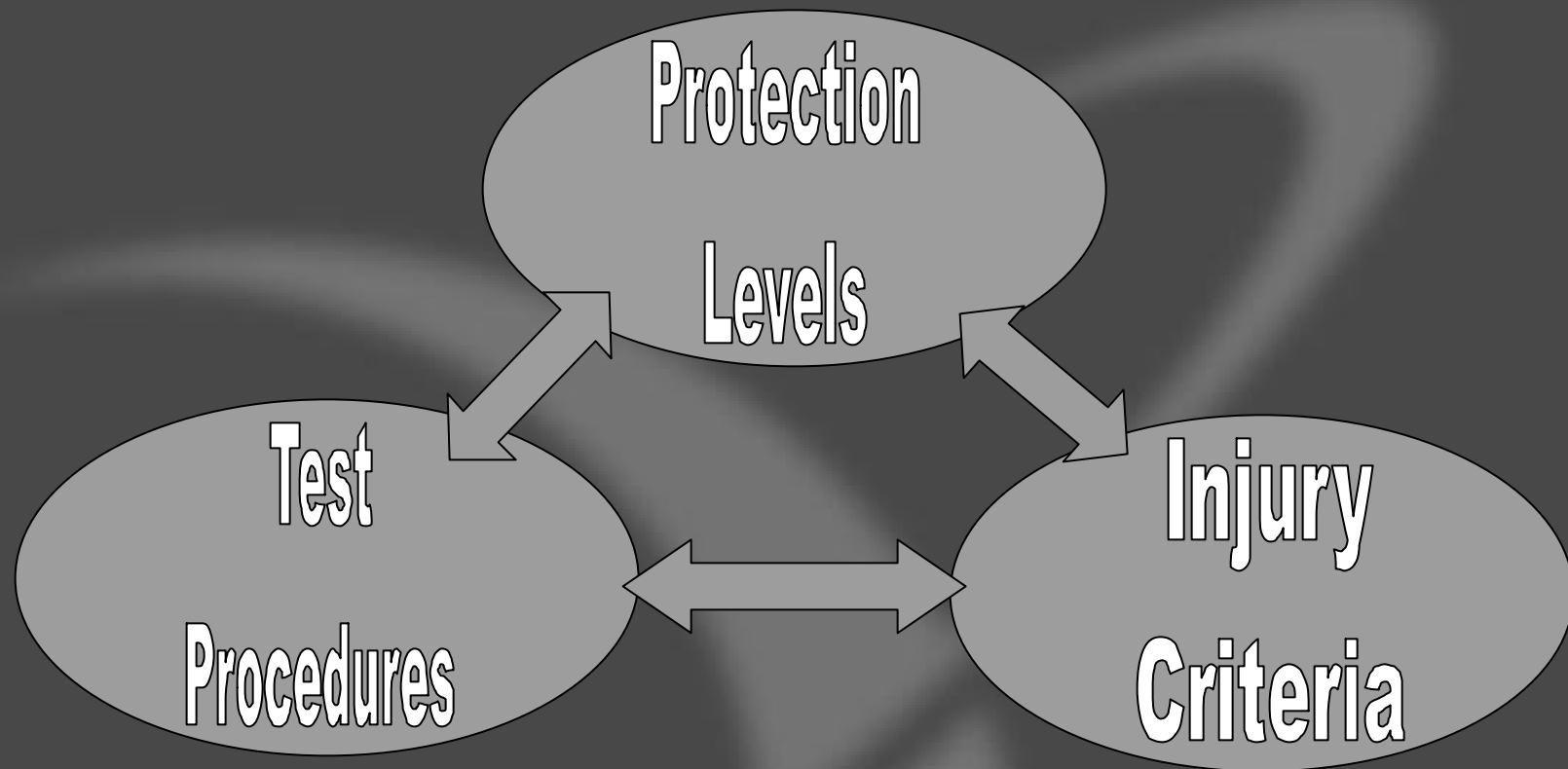
e.g. Take soil measurements

Standards

- Protection levels
- Test Procedures
- Criteria for injury

e.g. 8 kN is required to break a tibia

Standards



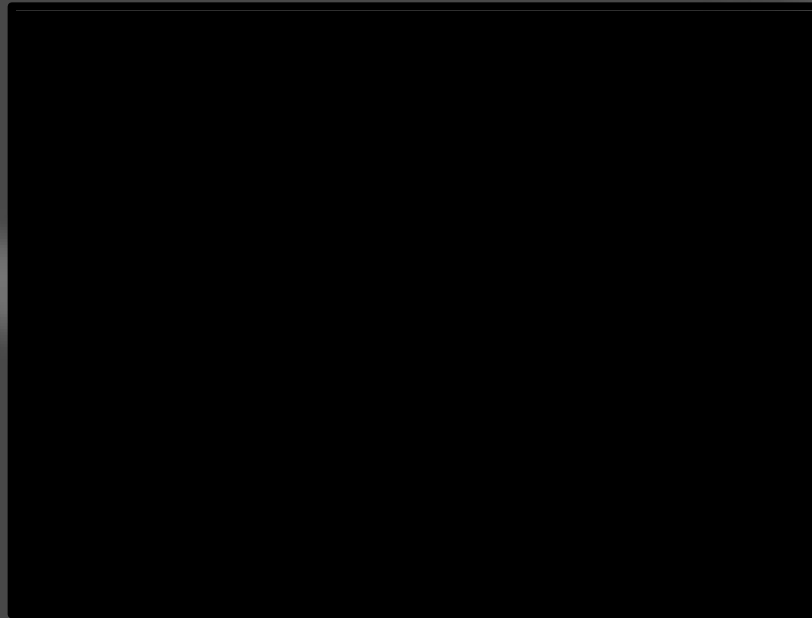
Protection Levels

- Requirement offices — Military personnel
- Armoured or soft-skinned (trucks)
- Track or wheel vehicle
- Wheel or belly detonation
- Charge weight and type

Test Procedures

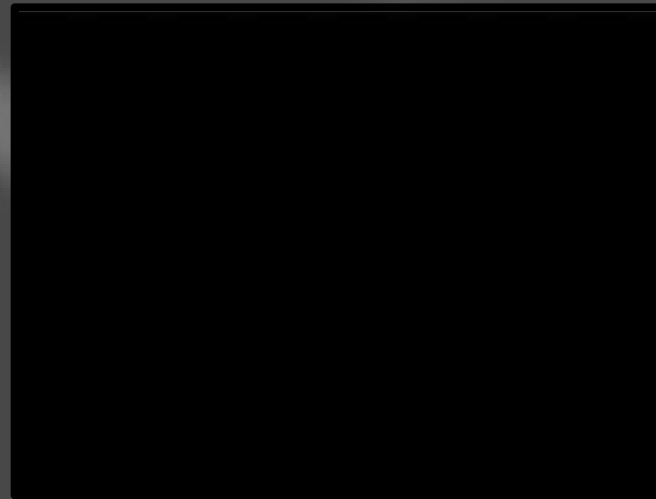
- Who needs them?
 - Scientists
 - Engineers
 - Designers
- Why?
 - Exchange data
 - Evaluate designs
 - Repeatability

Test Procedures



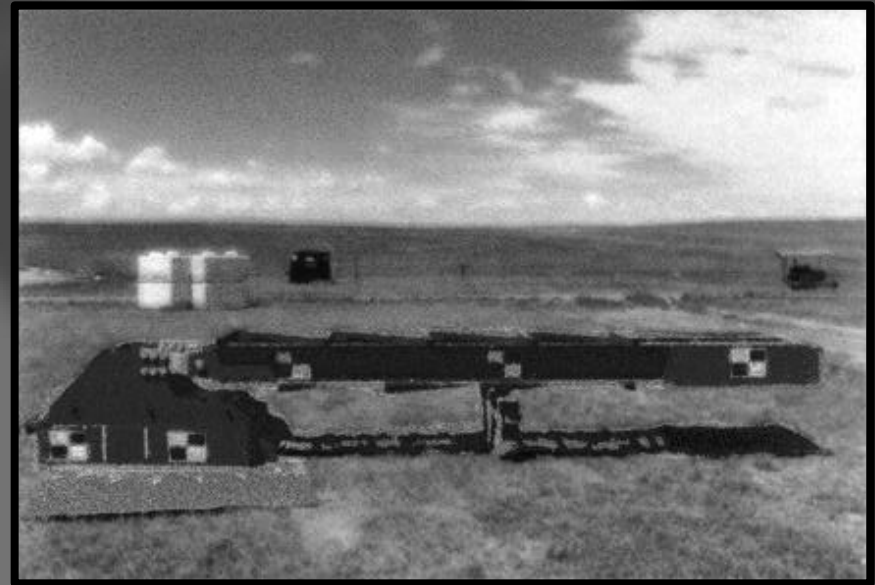
Test Procedures

- Take soil measurements



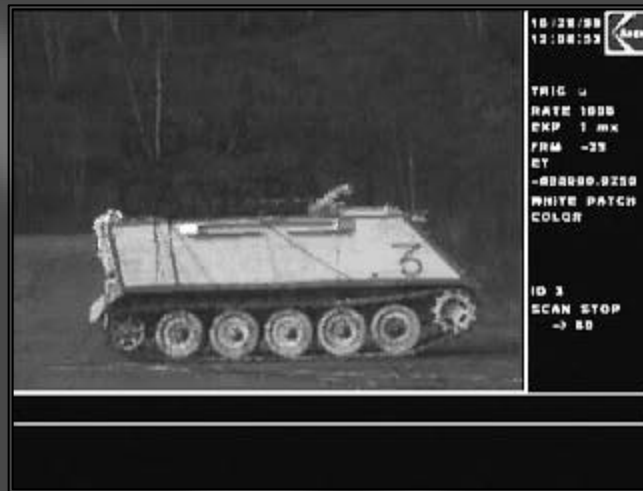
Test Procedures

- Take soil measurements
 - New KTA 1-34
 - Stand-off
 - Depth-of-burial
 - Soil composition
 - Soil moisture
 - Explosive type



Test Procedures

- Take soil measurements
- Use real or surrogate mine



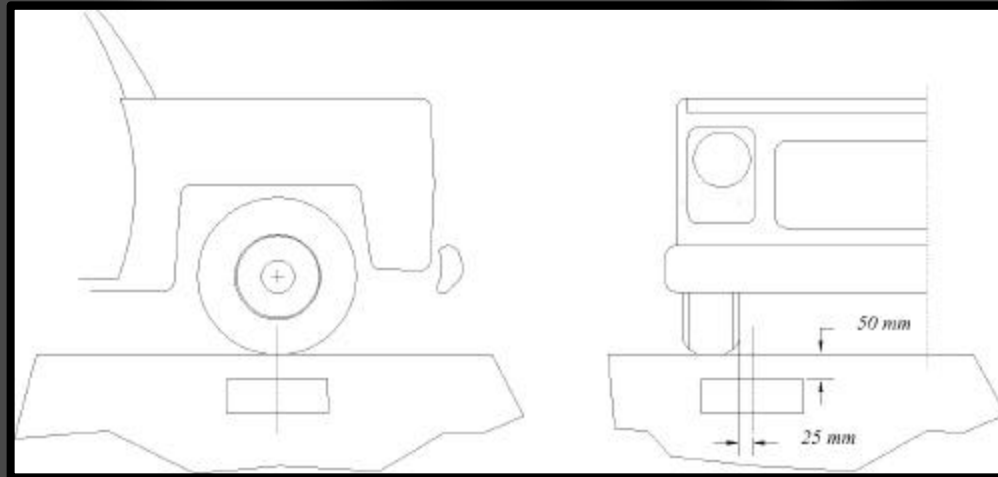
Test Procedures

- Take soil measurements
- Use real or surrogate mine
- Vehicle preload



Test Procedures

- Take soil measurements
- Use real or surrogate mine
- Vehicle preload
- Position of the charge

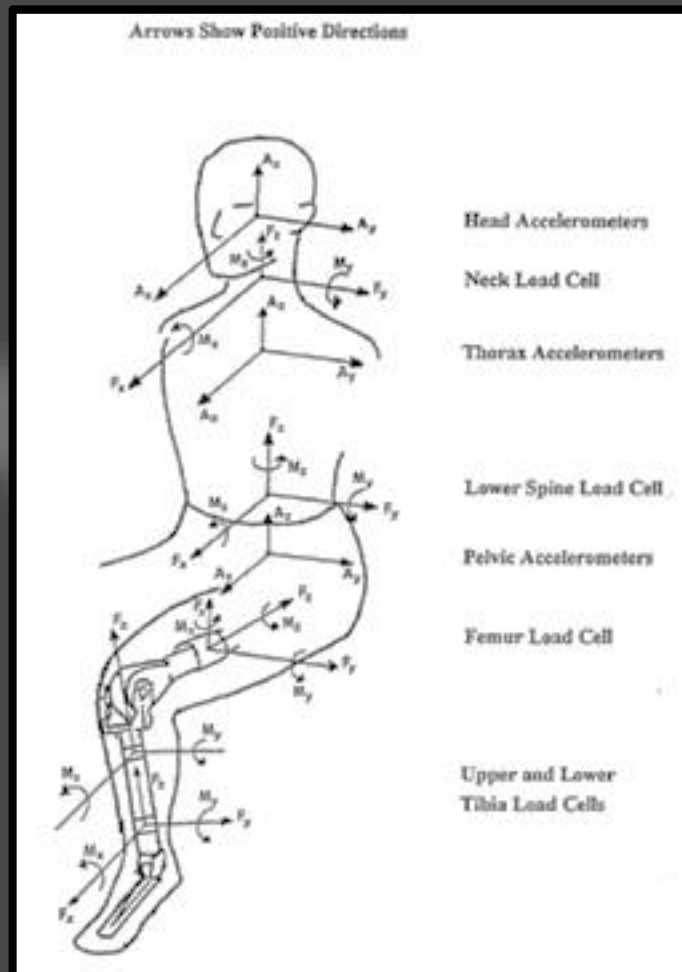


Test Procedures

- Take soil measurements
- Use real or surrogate mine
- Vehicle preload
- Position of the charge
- Anthropomorphic Test Devices



Test Procedures



Test Procedures



Test Procedures

(U) DTP SHOT NUMBER -
(U) SHOT NUMBER -
(U) DATE OF SHOT -

X - PENETRATION
● - PERFORATION
Dimensions are Length x Width x Depth in mm.

(U) SHEET ___ OF ___
DATA REPORTED FOR 1
MANIKIN ONLY

FRONT

LEFT

REAR

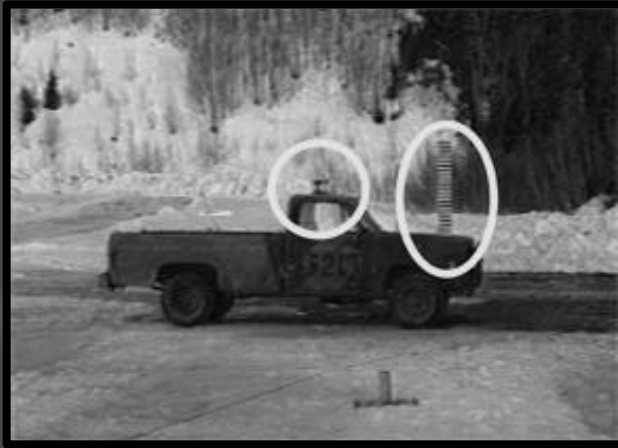
RIGHT

(U) SIMULANT TYPE -
(U) POSITION NO -
(U) CREW POSITION -
(U) CREW POSTURE -

(U) CLOTHING / UNIFORM

(U) REMARKS:

Test Procedures



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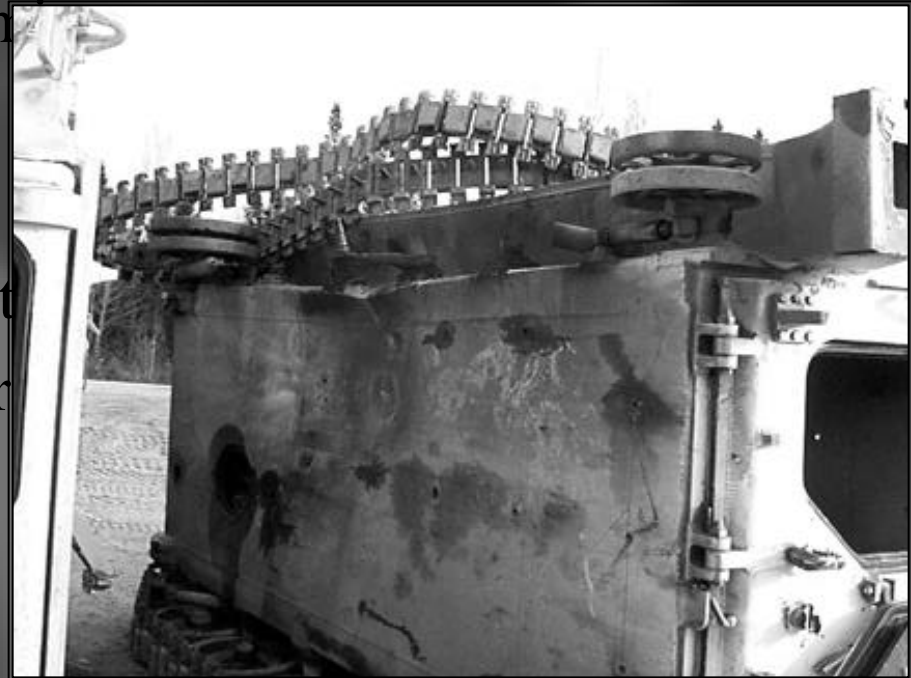
- Anthropomorphic Test Devices
- Pressure and accelerometer gauges



lcartier (DREV)

Test Procedures

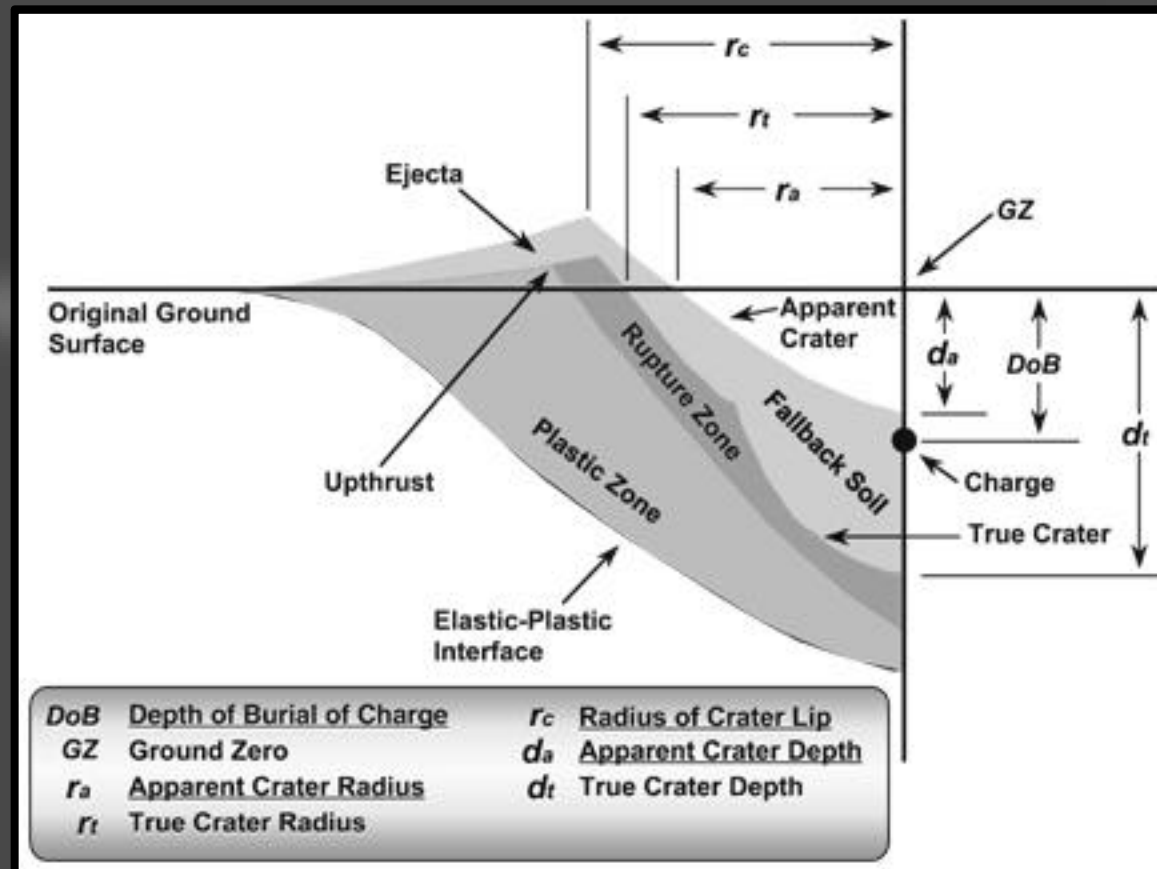
- Take soil measurements
- Use real or surrogate mine
- Vehicle preload
- Position of the charge
- Anthropomorphic Test
- Accelerometers and pressure
- Local deformations



Test Procedures

- Take soil measurements
- Use real or surrogate mine
- Vehicle preload
- Position of the charge
- Anthropomorphic Test Devices
- Accelerometers and pressure gauges
- Local deformations
- Crater measurements

Test Procedures



Test Procedures

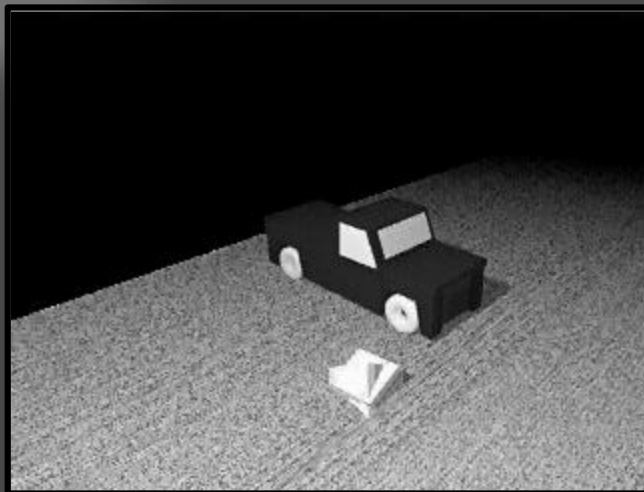


Injury Mechanisms

- Surgeons and physiologists

Injury Mechanisms

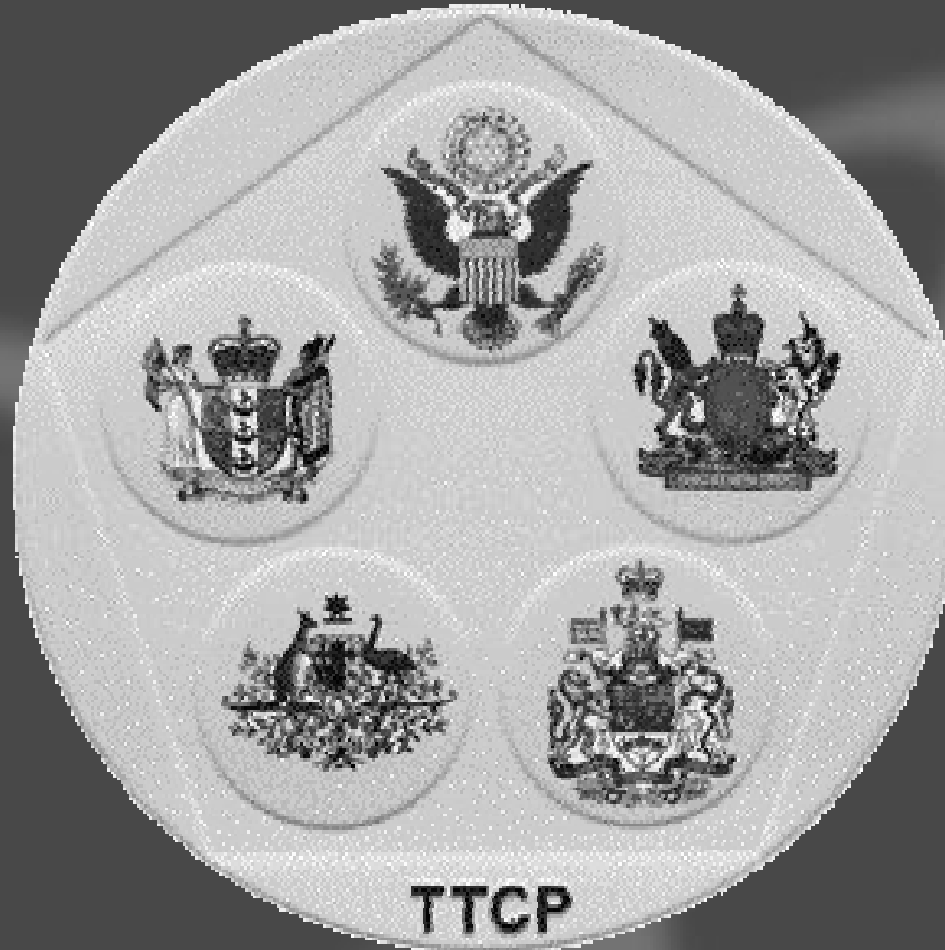
- Surgeons and physiologists
- Based mostly on vehicle accidents and ejection seats



In Summary...

- Protection levels need to be based on measurable information.
- Test procedures need to be standardised to compare apples with apples.
- Injury criteria must be applied. No penetration or cracks is not enough.

Questions?



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